
San Francisco
Estuary Invasive
Spartina Project
Preserving native wetlands
Coastal
Conservancy
Controlling Invasive Spartina in the
San Francisco Estuary
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Spartina Project Director
February 13, 2008
Humboldt County Spartina Summit
National Fish and Wildlife Foundation
CALFED
BAY-DELTA
PROGRAM
U.S.
FISH & WILDLIFE
SERVICE
WCB
State of California
Wildlife Conservation Board
SAN FRANCISCO BAY
JOINT VENTURE

Outline

1. Invasive *Spartina* problem in SF Bay
2. What the Spartina Project is doing about it
3. Focus on *S. densiflora*

Invasive *Spartina* in the San Francisco Estuary

Spartina is a cordgrass that grows in salt and brackish intertidal areas

Spartina foliosa (Pacific Cordgrass) is native to San Francisco Bay marshes.

S. foliosa occupies a specific niche, in balance with other native vegetation and important parts of the ecosystem.

Four species have been introduced in San Francisco Bay:

Spartina anglica

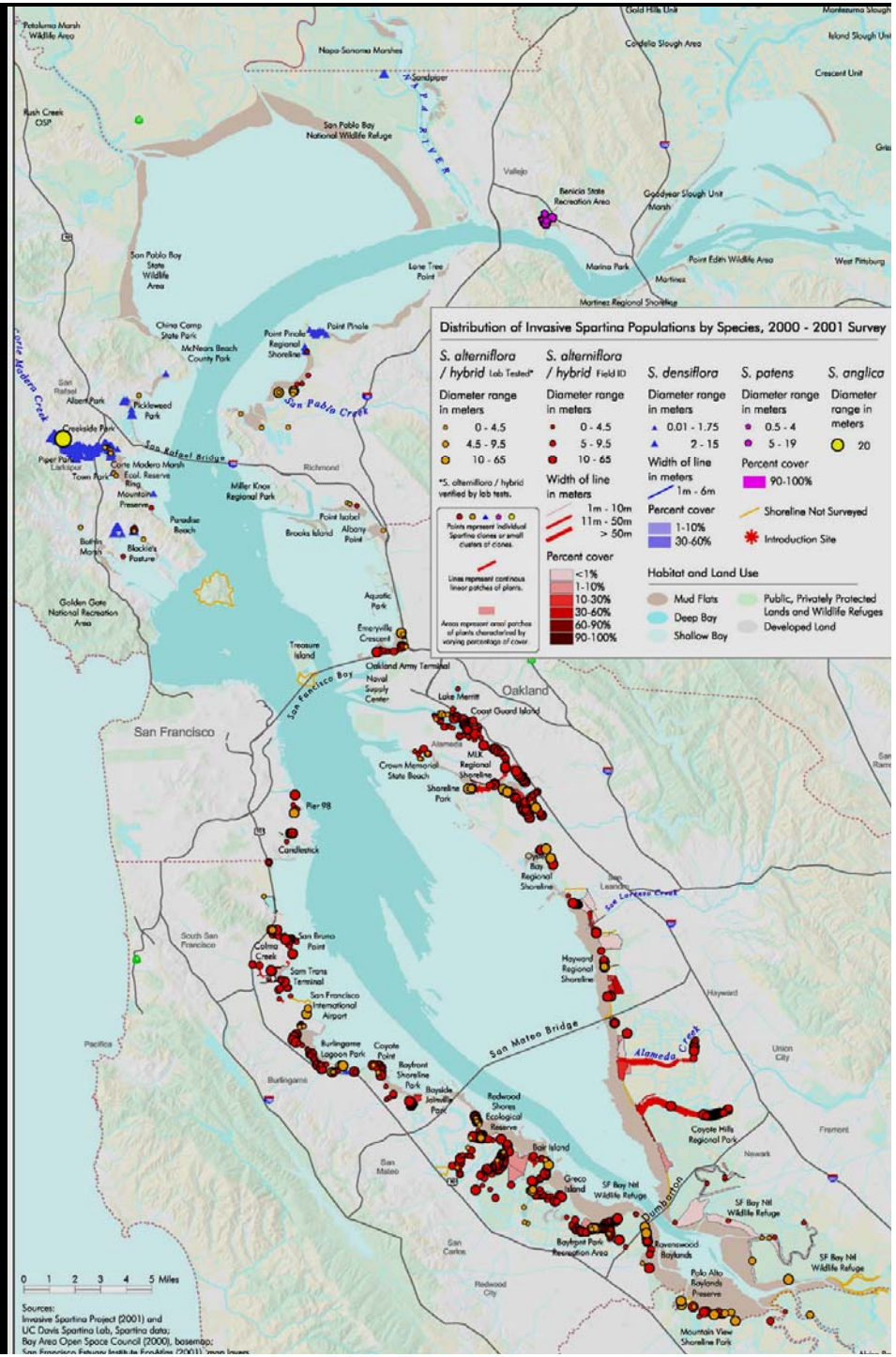
Spartina patens

Spartina densiflora

Spartina alterniflora **and hybrids**

Hybridized Atlantic Cordgrass
(S. alterniflora x *S. foliosa)*

Distribution of Non-native Spartina in the San Francisco Estuary



Why is invasive Spartina a Problem ?

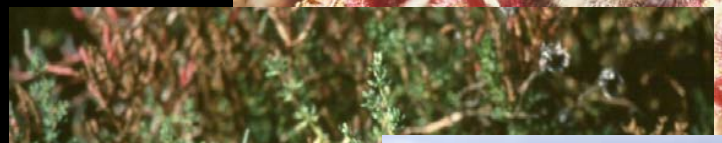
Degrades endangered species habitat

Hybridizes with native Pacific cordgrass

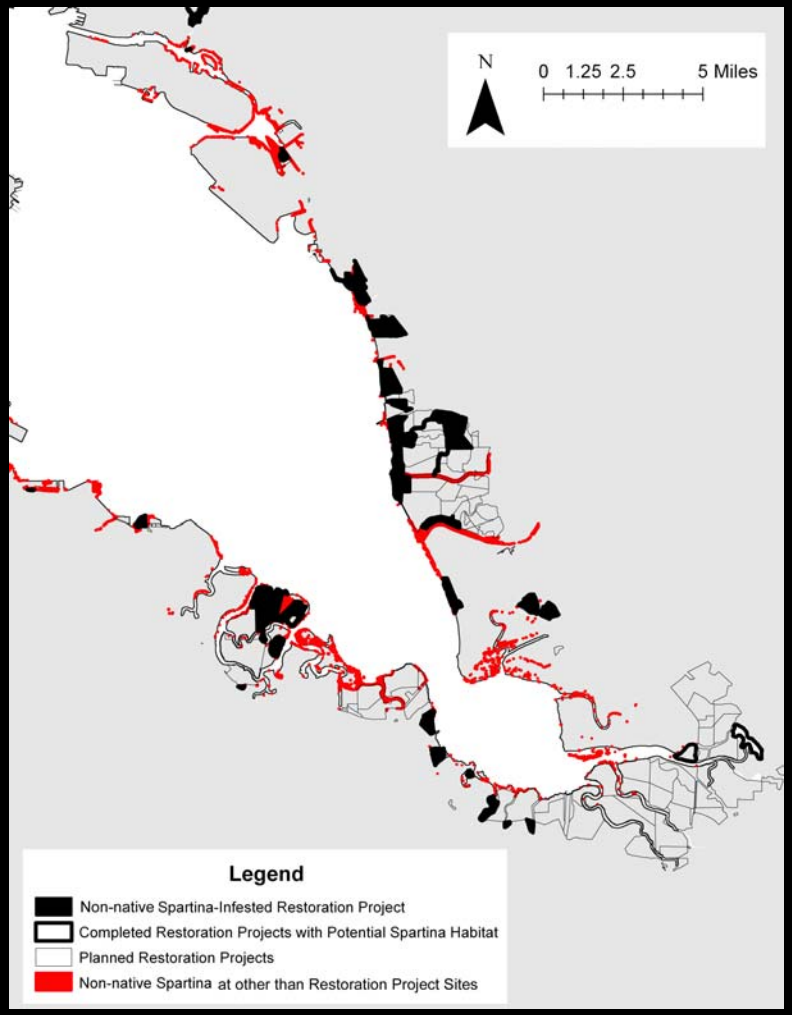
Dominates mudflats and restoration sites

Reduces flood control capacity

Creates mosquito breeding areas



Threatens the Success of Past, Present, and Future Restoration Efforts



- 2,000 acres of *Spartina*
- 18,000 acres of invaded wetlands
- 45 invaded restoration projects -3,800 acres
- >15K acres more planned restorations

San Francisco Estuary Invasive Spartina Project

- Formed in 2000 to coordinate regional control and eradication
- Funded by Conservancy, USFWS, and others - budget $1.5M to $3M /year
- Annual regional treatment started 2005
- Expect completion by 2012-2013

Ground Treatment

450 acres 2006
250 acres 2007

Aerial Treatment - Boom

1,350 acres 2006
800 acres 2007

Aerial Treatment – Spray Ball

0 acres 2006
15-20 acres 2007

Imazapyr Herbicide

- **Non-selective, systemic herbicide; works on both monocots (grasses, sedges, etc.) and broad-leaved plants**
- **“Habitat®” is aquatic formulation approved for estuaries**
- **Inhibits enzyme required for synthesis of 3 amino acids needed for plant growth; animals don’t produce these but rather acquire by consuming plants.**
- **Surfactant added to lower surface tension of liquid and improve spreading over the leaf, adherence to the plant, and penetration of the leaf cuticle**
- **ISP uses two surfactants: one is lecithin-based (Liberate), the other a methylated vegetable oil (Competitor)**
- **ISP does not use products containing nonylphenol ethoxylate (suspected endocrine disruption in fish)**

Imazapyr Toxicity

- **USEPA considers imazapyr "practically non-toxic" to wildlife, including mammals, birds, fish, and aquatic invertebrates**
- **Fish LC_{50}=22,305 mg/L**
- **ISP water quality monitoring – highest sample 0.5mg/L immediately post-treatment; followed by 99% reduction in 1st week**
- **Low potential to bioaccumulate**

Patten (2003) Persistence Field Studies (J. Aquatic Plant Mgnt)

- **Imazapyr primarily broken down in water by photolysis (half-life=2.5-5.3 days)**
- **Sunlight reduced imazapyr below detection quickly in estuary water (avg. 40 hrs)**
- **Disappears from mudflat sediment within average of 400 hrs**

2006 Burlingame Lagoon

2007 Burlingame Lagoon

2006 Airport Channel

2007 Airport Channel


Arrowhead Marsh, San Leandro Bay
Treated 2006 (helicopter)
Retreated 2007
Untreated
Treated 2006
(helicopter)
Retreated 2007


Sarcocornia pacifica (pickleweed)
able to resist impact from imazapyr

2007 Treatment

- 139 of 146 sites treated
  - Up from 107 of 135 in 2006
- 99% of Bay-wide acreage
  - Up from 94% in 2006
- Total Treatment ≈ 1050 acres
  - Down 40% from 2006
- ≈ 800 acres treated aerially
  - Down 41% from 2006
- ≈ 250 acres ground treated
  - Down 38% from 2006
- Most work in September
- Work done by grantees & their contractors

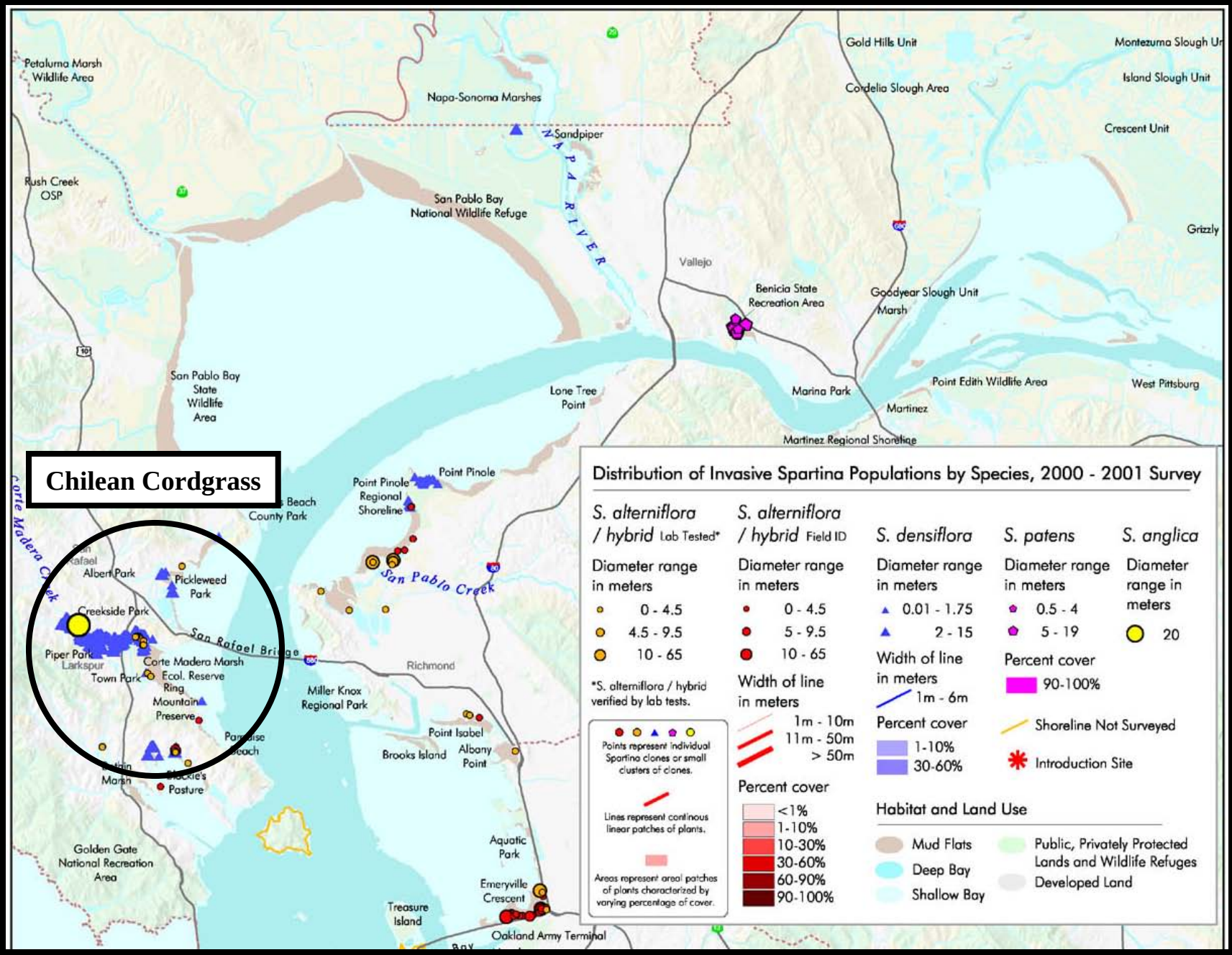
Conservancy Grant Recipients

- San Mateo County Mosquito Abatement District
- East Bay Regional Parks District
- Friends of Corte Madera Creek Watershed
- City of Alameda
- City of Palo Alto
- City of San Leandro
- USFWS, Don Edwards National Wildlife Refuge
- Alameda County Public Works
- California Wildlife Foundation
- California Department of Parks and Recreation
- Friends of Petaluma River

Grant recipients use the grant funds to either hire contractors or use their agency staff to implement the site-specific *Spartina* control plans in their area

S. densiflora in the San Francisco Estuary

- Primarily 1 watershed – Corte Madera Creek
  - 320 acres tidal marsh on 2 miles of creek
  - 12-25 acres *S. densiflora* (recently hybridized!)
  - Highly urbanized
- 1 non-profit organization – Friends of Corte Madera Creek Watershed
  - 2 staff plus contractors and volunteers
  - $50K-100K/year grant


Chilean Cordgrass
Distribution of Invasive Spartina Populations by Species, 2000 - 2001 Survey
S. alterniflora / hybrid Lab Tested*
Diameter range in meters
0 - 4.5
4.5 - 9.5
10 - 65
*S. alterniflora / hybrid verified by lab tests.
S. alterniflora / hybrid Field ID
Diameter range in meters
0 - 4.5
5 - 9.5
10 - 65
Width of line in meters
1m - 10m
11m - 50m
> 50m
Percent cover
<1%
1-10%
10-30%
30-60%
60-90%
90-100%
S. densiflora
Diameter range in meters
0.01 - 1.75
2 - 15
Width of line in meters
1m - 6m
Percent cover
1-10%
30-60%
S. patens
Diameter range in meters
0.5 - 4
5 - 19
Percent cover
90-100%
Shoreline Not Surveyed
Introduction Site
S. anglica
Diameter range in meters
20
Points represent individual Spartina clones or small clusters of clones.
Lines represent continous linear patches of plants.
Areas represent areal patches of plants characterized by varying percentage of cover.
Habitat and Land Use
Mud Flats
Deep Bay
Shallow Bay
Public, Privately Protected Lands and Wildlife Refuges
Developed Land
Petaluma Marsh Wildlife Area
Napa-Sonoma Marshes
Sandpiper
NAPA RIVER
Rush Creek OSP
San Pablo Bay National Wildlife Refuge
Gold Hills Unit
Montezuma Slough Unit
Island Slough Unit
Cordelia Slough Area
Crescent Unit
Grizzly
Vallejo
Benicia State Recreation Area
Goodyear Slough Unit Marsh
San Pablo Bay State Wildlife Area
Lone Tree Point
Marina Park
Point Edith Wildlife Area
West Pittsburg
Martinez
Martinez Regional Shoreline
Point Pinole
Point Pinole Regional Shoreline
Beach County Park
San Pablo Creek
Albert Park
Pickleweed Park
Creekside Park
San Rafael Bridge
Piper Park
Larkspur
Town Park
Corte Madera Marsh Ecol. Reserve
Ring Mountain Preserve
Richmond
Miller Knox Regional Park
Point Isabel
Albany Point
Brooks Island
Paradise Beach
Shollenberger Marsh
Sheckle's Pasture
Golden Gate National Recreation Area
Aquatic Park
Emeryville Crescent
Treasure Island
Oakland Army Terminal

Digging

Digging Notes

- January 2008 – dug 13.2 tons in 4 days
- Average 11 lbs per plant, up to 100 lbs!
- Get all of the roots!
- Take plants off site (landfill) or will reroot
- Build litters with poles & plastic
- This year lots of seedlings around holes where dug

Herbicide

Results

Strange S. densiflora Herbicide Responses

Spraying Notes

- Spotty results – early season best
- Find new live seedlings in and around sprayed dead/partially dead plants
- Rolled leaves may resist herbicide
- Small or sick plants don’t uptake as well
- Try combos of spray and dig when plant smaller and weakened

Overall Notes

- Control/eradication still seems possible
- Requires systematic follow up for several years


Thank You
www.spartina.org